

A Roadmap for Biological and Environmental Research: Objectives and Performance Targets

2006

2008

2010

2012

2014

2016

Life Sciences

Mathematical model for microbial community that detoxifies uranium (2007)			New strategies for CO2 capture (2012) AG	○ Characterize the multi protein complexes (or the lack thereof) involving a scientifically significant fraction of a microbe's proteins. Develop computational models to direct the use and design of microbial communities to clean up waste, sequester carbon, or produce hydrogen. (2015)
Artificial chromosome (2006)	Photosynthetic microbe for continuous hydrogen production (2008)	New capabilities for using microbial communities to solve complex energy challenges (2010)	Enhanced biobased sources of fuel and electricity (2012) AG	
			New knowledge base for cost-effective cleanup (2012) EM	

Climate Change Research

Deliver new measurements of clouds where observations are missing (2006)	Measure ecosystem responses to climate change (2008) NOAA	Develop/validate new models predicting effect of aerosols on climate forcing (2010)		○ Deliver improved climate data & models for policy makers to determine safe levels of greenhouse gases (2015). Reduce differences between observed temperature & model simulations at subcontinental scales using several decades of recent data (2013). NOAA
Include realistic cloud simulations in a climate model (2007)		Provide a climate model that links the Earth climate system with Earth's biological systems (2010) NOAA		

Environmental Remediation

Alternative cesium separations process for High Level Waste (2006) EM	New technologies for in situ characterization (2008) EM			○ Develop science-based solutions for cleanup and long-term monitoring of DOE contaminated sites (2015). A significant fraction of DOE's long-term stewardship sites will employ advanced biology-based clean up solutions and science-based monitors (2013). EM
Technical basis for leaving in place radionuclides beneath tank farm at the Hanford Site (2007) EM	Bioremediation of metals and rads validated in the field (2008) EM	Validate new long-term monitoring tools at multiple field sites that are inexpensive and fast (2010)	Suite of field characterization techniques for long-term monitoring of closed sites (2012) EM	

Medical Sciences

60-electrode retinal devices implanted in humans (2005) NIH	Microfabrication of 1000-electrode prototype artificial retina (2006) NIH	In vitro testing of 1000-electrode artificial retina devices in dogs (2007) NIH	Nuclear medicine centers "graduate" first class of new radio tracer chemists to support U.S. nuclear medicine (2010)	● Department-sponsored research into viewing the makeup of genes in living cells, tissues, and organisms is used by clinicians as a new, sensitive tool for diagnosing disease and for monitoring the efficacy of disease therapies that target the products of specific genes. (2013)
Preclinical tests of radiolabeled probes for imaging defective genes (2006)				

Future Facilities (Cross cut and support multiple objectives and targets):

Protein Production and Tags Facility: construction begins (2006)
Analysis and Modeling of Cellular Systems Facility: construction begins (2006)
Whole Proteome Analysis Facility: construction begins (2006)

Protein Facility: operation begins (2011)
Cellular Systems Facility: operation begins (2010)
Proteome Facility: operation begins (2010)

Characterization and Imaging of Molecular Machines Facility: construction begins (2006) **Characterization and Imaging Facility:** operation begins (2010)

Interdependencies: (Descriptions)

Broadly with **ASCR** on computational developments, both hardware and software, affecting all facets of basic research and advanced instrumentation.

EM =with EM and between two cleanup timeline elements, as noted.

NIH =with National Institutes of Health

AG =with Agriculture and EPA.

NOAA =with Commerce and other contributing agencies

Future facilities directly support performance targets in the life sciences, and through this, subsequent targets in climate change and environmental remediation.

● =Key Intermediate Objective from DOE Strategic Plan
 ○ =Long Term Success Measure from PART

This timeline is for planning purposes only and does not constitute financial or contractual commitments by the Federal Government.